AMENDMENTS

In The Claims

1. (currently amended) A fully automatic deionizer, comprising:

at least one treating unit, comprising an electrode module and a housing, wherein the electrode module comprises at least one pair of anode and cathode made by coating an active material on an electrically conductive substrate;

at least one DC power source to supply electricity to the electrode module for removing ionic species from liquids[~~, i.e.,~~] for deionization;

at least one capacitor to store electricity extracted from the electrode module for desorbing the ionic species from the electrode module[~~, i.e.,~~] for regenerating the electrode module;

at least one on-line sensor and at least one fluid valve for detecting and for diverting liquid flow in the treating unit; and

at least one micro-controller for controlling the deionization, the electricity extraction from the electrode module, and the liquid flow.

2. (original) The fully automatic deionizer of claim 1, wherein the active material is selected from a group consisting of activated carbon, C_{60}, carbon nanotube, MnO_2, Fe_3O_4 and combination thereof.

3. (original) The fully automatic deionizer of claim 1, wherein the electrically conductive

substrate is selected from a group consisting of Ti, Pt and Pd.

4. (original) The fully automatic deionizer of claim 1, wherein the electrically conductive substrate is in the form of foil, plate, mesh, or web.

5. (original) The fully automatic deionizer of claim 1, wherein the electrode module is in the form of cylinder, cube, or rectangle.

6. (original) The fully automatic deionizer of claim 1, wherein the DC power source applies a DC voltage to the electrode module for a period from 30 seconds to 4 minutes for deionization.

7. (original) The fully automatic deionizer of claim 6, wherein more than 30% of a process energy of the deionization is recovered from the electrode module.

8. (original) The fully automatic deionizer of claim 1, which is designed so that electricity is extracted from the electrode module in less than one minute.

9. (original) The fully automatic deionizer of claim 1, wherein a liquid is provided to transport the ionic species desorbed from the electrode module to a reservoir.

10. (original) The fully automatic deionizer of claim 9, wherein the ionic species are stored in the reservoir to be concentrated for recycle, for recovery, or for disposal.

11. (original) The fully automatic deionizer of claim 9, wherein the liquid is selected from a group consisting of fresh water, brine and seawater.

12. (original) The fully automatic deionizer of claim 1, wherein the capacitor is selected from a group consisting of supercapacitor, ultracapacitor and electric double layer capacitor.

13. (original) The fully automatic deionizer of claim 1, wherein the on-line sensor is used

to on-line monitor conductivity, resistivity, pH, temperature, or optical absorbance of liquids.

14. (original) The fully automatic deionizer of claim 1, wherein the fluid valve is actuated and controlled by electrical current.

15. (original) The fully automatic deionizer of claim 1, comprising a plurality of treating units connected in series, a plurality of on-line sensors and a plurality of fluid valves, wherein at least one on-line sensor and at least one fluid valve are used for detecting and for diverting liquid flow in one treating unit.

16. (currently amended) A fully automatic deionizer, comprising:

at least two sets of treating units, wherein each set comprises at least one treating unit that comprises an electrode module and a housing, wherein the electrode module comprises at least one pair of anode and cathode made by coating an active material on an electrically conductive substrate;

at least one DC power source to supply electricity to the electrode modules for removing ionic species from liquids[~~, i.e.,~~] for deionization;

at least one capacitor to store electricity extracted from the electrode modules for desorbing the ionic species from the electrode modules[~~, i.e.,~~] for regenerating the electrode modules;

a plurality of on-line sensors and a plurality of fluid valves, wherein at least one on-line sensor and at least one fluid valve are used for detecting and for diverting liquid flow in one treating unit; and

at least one micro-controller for controlling the deionization, the electricity extraction

from the electrode modules, and the liquid flow, wherein

a first set of treating units are switched to deionization and a second set to regeneration at one moment, while the first set of treating units are switched to regeneration and the second set to deionization at next moment.

17. (original) The fully automatic deionizer of claim 16, wherein the active material is selected from a group consisting of activated carbon, C_{60}, carbon nanotube, MnO_2, Fe_3O_4 and combination thereof.

18. (original) The fully automatic deionizer of claim 16, wherein the electrically conductive substrate is selected from a group consisting of Ti, Pt and Pd.

19. (original) The fully automatic deionizer of claim 16, wherein the electrically conductive substrate is in the form of foil, plate, mesh, or web.

20. (original) The fully automatic deionizer of claim 16, wherein the electrode module is in the form of cylinder, cube, or rectangle.

21. (original) The fully automatic deionizer of claim 16, wherein the DC power source applies a DC voltage to the electrode module for a period from 30 seconds to 4 minutes for the deionization.

22. (original) The fully automatic deionizer of claim 21, wherein more than 30% of a process energy of the deionization is recovered from the electrode modules.

23. (original) The fully automatic deionizer of claim 16, which is designed so that electricity is extracted from the electrode modules in less than one minute.

24. (original) The fully automatic deionizer of claim 16, wherein a liquid is provided to

transport the ionic species desorbed from the electrode modules to a reservoir.

25. (original) The fully automatic deionizer of claim 24, wherein the ionic species are stored in the reservoir to be concentrated for recycle, for recovery, or for disposal.

26. (original) The fully automatic deionizer of claim 24, wherein the liquid is selected from a group consisting of fresh water, brine and seawater.

27. (original) The fully automatic deionizer of claim 16, wherein the capacitor is selected from a group consisting of supercapacitor, ultracapacitor and electric double layer capacitor.

28. (original) The fully automatic deionizer of claim 16, wherein the on-line sensors are used to on-line monitor conductivity, resistivity, pH, temperature, or optical absorbance of liquids.

29. (original) The fully automatic deionizer of claim 16, wherein the fluid valves are actuated and controlled by electrical current.

30. (original) The fully automatic deionizer of claim 16, wherein each set of treating units comprises a plurality of treating units that are connected in series, a plurality of on-line sensors and a plurality of fluid valves.